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Si DOPED AND UNDOPED CHROMIUM NITRIDE COATINGS: A COMPARATIVE STUDY OF THE PHYSICAL PROPERTIES

Luis CUNHA, Cacilda MOURA

Center of Physics, University of Minho, Braga – PORTUGAL

ABSTRACT

Chromium nitride and silicon doped chromium nitride thin films have been deposited by r.f. reactive magnetron sputtering. This study corresponds to the investigation of the influence of processing parameters and of the addition of silicon on the chromium nitride matrix on the properties of the produced films. The characterization of the coatings was performed by X-ray diffraction (XRD), and nano-indentation experiments. Results concerning the crystalline phases, crystal orientation/texture, crystallite size, mechanical properties and their correlations, are presented. The increase of the nitrogen partial pressure in the working atmosphere produces changes from a body-centered cubic (bcc) Cr structure, to hexagonal Cr_2N, to face-centered cubic (fcc) CrN structure. The CrN crystallites evidence a fcc (111) preferred orientation. The highest hardness is achieved in a coating with dominant CrN phase (45 GPa) with a crystallite size around 18 nm. The addition of Si, in the films with CrN dominant phase, maintains the CrN (111) preferred orientation and produces changes in films hardness, depending on deposition conditions.

Keywords: CrN crystallites, Chromium nitride thin films